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| **Section 1.2** | **A View of Earth** |

**Key Concepts**

* [What are the four major spheres into which Earth is divided?](javascript:openCrossRef('../ch1/ch1_s2_1.html%23lnk7.5'))
* [What defines the three main parts of the solid Earth?](javascript:openCrossRef('../ch1/ch1_s2_1.html%23lnk8.5'))
* [Which model explains the position of continents and the occurrence of volcanoes and earthquakes?](javascript:openCrossRef('../ch1/ch1_s2_2.html%23lnk10.1'))

**Vocabulary**

* [hydrosphere](javascript:openCrossRef('../ch1/ch1_s2_1.html%23lnk7.4'))
* [atmosphere](javascript:openCrossRef('../ch1/ch1_s2_1.html%23lnk7.4'))
* [geosphere](javascript:openCrossRef('../ch1/ch1_s2_1.html%23lnk7.4'))
* [biosphere](javascript:openCrossRef('../ch1/ch1_s2_1.html%23lnk7.5'))
* [core](javascript:openCrossRef('../ch1/ch1_s2_1.html%23lnk8.5'))
* [mantle](javascript:openCrossRef('../ch1/ch1_s2_1.html%23lnk8.5'))
* [crust](javascript:openCrossRef('../ch1/ch1_s2_1.html%23lnk8.5'))

**Reading Strategy**

**Predicting** Before you read, predict the meaning of the vocabulary words. After you read, revise your definition if your prediction was incorrect.

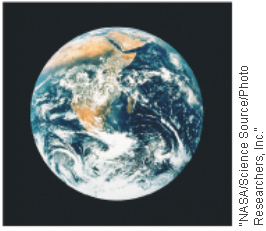
A view such as the one in Figure 5A provided the *Apollo 8* astronauts with a unique view of our home. Seen from space, Earth is breathtaking in its beauty. Such an image reminds us that our home is, after all, a planet—small, self-contained, and in some ways even fragile.

If you look closely at Earth from space, you may see that it is much more than rock and soil. The swirling clouds and the vast global ocean emphasize the importance of water on our planet.

**Earth’s Major Spheres**

The view of Earth shown in Figure 5B should help you see why the physical environment is traditionally divided into three major spheres: the water portion of our planet, the [**hydrosphere**](javascript:openGlossaryWnd('e_ga_06_hydrosphere')); Earth’s gaseous envelope, the [**atmosphere**](javascript:openGlossaryWnd('e_ga_06_atmosphere')); and the [**geosphere**](javascript:openGlossaryWnd('e_ga_06_geosphere')).





**Figure 5 A** View that greeted the *Apollo 8* astronauts as their spacecraft emerged from behind th Moon. **B** Africa and Arabia are prominent in this image of Earth taken from *Apollo 17.* The tan areas are desert regions. The bands of clouds over central Africa are associated with rainforests. Antarctica, which is covered by glacial ice, is visible at the south pole. The dark blue oceans and white swirling clouds remind us of the importance of oceans and the atmosphere.

Our environment is characterized by the continuous interactions of air and rock, rock and water, and water and air. The [**biosphere**](javascript:openGlossaryWnd('e_ga_06_biosphere')), which is made up of all the life-forms on Earth, interacts with all three of these physical spheres. **Earth can be thought of as consisting of four major spheres: the hydrosphere, atmosphere, geosphere, and biosphere.**

**Hydrosphere**

Water is what makes Earth unique. All of the water on Earth makes up the hydrosphere. Continually on the move, water evaporates from the oceans to the atmosphere, falls back to Earth as rain, and runs back to the ocean. The oceans account for approximately 97 percent of the water on Earth. The remaining 3 percent is fresh water and is present in groundwater, streams, lakes, and glaciers.

Although these freshwater sources make up a small fraction of the total amount of water on Earth, they are quite important. Streams, glaciers, and groundwater are responsible for sustaining life and creating many of Earth’s varied landforms.

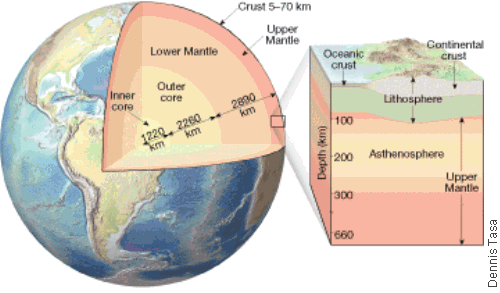
**Atmosphere**

A life-sustaining, thin, gaseous envelope called the atmosphere surrounds Earth. It reaches beyond 100 kilometers above Earth, yet 90 percent occurs within just 16 kilometers of Earth’s surface. This thin blanket of air is an important part of Earth. It provides the air that we breathe. It protects us from the sun’s intense heat and dangerous radiation. The energy exchanges that continually occur between space, the atmosphere, and Earth’s surface produce weather and climate.

If Earth had no atmosphere, life on our planet as we know it could not exist. Many of the processes and interactions that make the surface such a dynamic place would not occur. For example, without weathering and erosion, the face of our planet might more closely resemble the moon.

**Geosphere**

Lying beneath both the atmosphere and the ocean is the geosphere. **Because the geosphere is not uniform, it is divided into three main parts based on differences in composition—the** [**core**](javascript:openGlossaryWnd('e_ga_06_core'))**, the** [**mantle**](javascript:openGlossaryWnd('e_ga_06_mantle'))**, and the** [**crust**](javascript:openGlossaryWnd('e_ga_06_crust'))**.** Figure 6A shows the dense or heavy inner sphere that is the core; the less dense mantle; and the lighter, thin crust. The crust is not uniform in thickness. It is thinnest beneath the oceans and thickest beneath the continents. Figure 6B shows that the crust and uppermost mantle make up a rigid outer layer called the lithosphere. Beneath the lithosphere, the rocks become partially molten, or melted. They are able to slowly flow because of the uneven distribution of heat deep within Earth. This region is called the asthenosphere. Beneath the asthenosphere, the rock becomes more dense. This region of Earth is called the lower mantle.



**Figure 6 A** On this diagram, the inner core, outer core, and mantle are drawn to scale but the thickness of the crust is exaggerated by about 5 times. **B** There are two types of crust—oceanic and continental. The lithosphere is made up of the crust and upper mantle. Below the lithosphere are the asthenosphere and the lower mantle.

**Biosphere**

The biosphere includes all life on Earth. It is concentrated in a zone that extends from the ocean floor upward for several kilometers into the atmosphere. Plants and animals depend on the physical environment for life. However, organisms do more than just respond to their physical environment. Through countless interactions, organisms help maintain and alter their physical environment. Without life, the makeup and nature of the solid Earth, hydrosphere, and atmosphere would be very different.

**Plate Tectonics**

You have read that Earth is a dynamic planet. If we could go back in time a billion years or more, we would find a planet with a surface that was dramatically different from what it is today. Such prominent features as the Grand Canyon, the Rocky Mountains, and the Appalachian Mountains did not exist. We would find that the continents had different shapes and were located in different positions from those of today.

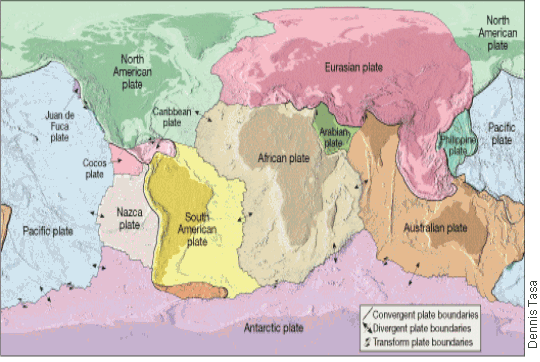
There are two types of forces affecting Earth’s surface. *Destructive forces* such as weathering and erosion work to wear away high points and flatten out the surface. *Constructive forces* such as mountain building and volcanism build up the surface by raising the land and depositing new material in the form of lava. These constructive forces depend on Earth’s internal heat for their source of energy.

Within the last several decades, a great deal has been learned about the workings of Earth. In fact, this period is called a revolution in our knowledge about Earth. This revolution began in the early part of the twentieth century with the idea that the continents had moved about the face of the Earth. This idea contradicted the accepted view that the continents and ocean basins are stationary features on the face of Earth. Few scientists believed this new idea. More than 50 years passed before enough data were gathered to transform this hypothesis into a widely accepted theory. **The theory that finally emerged, called plate tectonics, provided geologists with a model to explain how earthquakes and volcanic eruptions occur and how continents move.**

**Reading Checkpoi**

(a)What is the difference between destructive forces and constructive forces?

According to the plate tectonics model, Earth’s lithosphere is broken into several individual sections called plates. Figure 7 on page 9 shows their current position. These plates move slowly and continuously across the surface. This motion is driven by the result of an unequal distribution of heat within Earth. Ultimately, this movement of Earth’s lithospheric plates generates earthquakes, volcanic activity, and the deformation of large masses of rock into mountains. You will learn more about the powerful effects of plate tectonics in Chapter 9.



**Figure 7 Plate Tectonics** There are currently 7 major plates recognized and numerous smaller plates. **Relating Cause Effect** What is the relationship between mountain chains and plate boundaries?

**SECTION 1.2 Assessment**

**Reviewing Concepts**

(1)Which of Earth’s spheres do each of these features belong: lake, meadow, canyon, cloud? [](javascript:openCrossRef('../ch1/ch1_s2_1.html%23lnk7.5'))

(2)What are the three main parts of the geosphere? [](javascript:openCrossRef('../ch1/ch1_s2_1.html%23lnk8.5'))

(3)Why is the solid Earth layered? [](javascript:openCrossRef('../ch1/ch1_s2_1.html%23lnk8.5'))

(4)The plate tectonics theory explains the existence and occurrence of what features? [](javascript:openCrossRef('../ch1/ch1_s2_2.html%23lnk10.1'))

(5)What sort of energy allows the tectonic plates to move? [](javascript:openCrossRef('../ch1/ch1_s2_2.html%23lnk10.2'))

(6)Describe an example of how water moves through the hydrosphere. [](javascript:openCrossRef('../ch1/ch1_s2_1.html%23lnk8.1'))

**Critical Thinking**

~~(7)~~ **~~Inferring~~** ~~Using the definitions of spheres as they occur on Earth, what spheres do you think are present on Venus~~? [](javascript:openCrossRef('../ch1/ch1_s2_1.html%23lnk7.4'))

(8) **Applying Concepts** Describe a situation in which two or more of Earth’s spheres are interacting. [](javascript:openCrossRef('../ch1/ch1_s2_1.html%23lnk7.4'))

**Connecting Concepts**